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Children with wheat allergy usually tolerate oats

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Tweetable abstract:

We show that oats-sensitized children with wheat allergy tolerate oats in an open oral food challenge. Only one challenge out of 15 was positive and the reaction was mild.

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Impact statement:

Wheat is one of the five most common foods causing allergy in young children. Wheat-allergic children commonly tolerate ingested oats regardless of sensitization to oats measured by specific IgE assays or skin prick tests.

We show that 14 of 15 children with wheat allergy tolerated 1600mg of oats in an open oral food challenge. All 15 children were sensitized to oats, but specific IgE levels were significantly lower than those to wheat. Only one oats challenge was positive and the reaction was mild. Oats can be safely tested at home in wheat allergy if there is no previous history of an allergic reaction to oats.

Key Words: food allergy, children, specific IgE, wheat, oats, food challenge

Abstract

Introduction:

Wheat is among the five most common foods causing allergy in young children. In about 70%, wheat allergy resolves by school age. Wheat-allergic children are frequently sensitized to oats, but they seem to tolerate ingested oats in their diet.

Oats have been reported to cause non-IgE-mediated reactions and are a well-known elicitor of FPIES. On the contrary, IgE-mediated allergy to oats is rare, and only a few case reports on severe IgE-mediated reactions have been published.

Aim

The aim of this study was to evaluate whether oats-sensitized children with persistent wheat allergy tolerate ingested oats.

Methods

Fifteen children aged 9-16 years with a clinical history of severe wheat allergy were recruited. All children were sensitized to wheat, gliadin, and oats (specific IgE ≥0.35 kU/l and/or skin prick test ≥3 mm). Thirteen patients underwent an open oral wheat challenge; two patients were not challenged because of a severe reaction to wheat within the past 3 months. All 15 patients underwent an open oral oats challenge within 42 days.

Results

All 13 wheat challenges were positive. Fourteen of the 15 oats challenges were negative with a cumulative dose of 1600mg protein. Only one patient had a positive oats challenge with a mild reaction at a cumulative dose of 600mg protein.

Conclusion

The majority of wheat-allergic, oats-sensitized children tolerate ingested oats. Oats can be safely tested at home if there is no clinical history of a reaction to oats.

Children with wheat allergy usually tolerate oats

To the Editor:

Wheat is among the five most common food allergies in children with a prevalence of 0.3–0.5 % worldwide (1). In Finland, Japan, and Germany, wheat is the third most common food allergy in young children (2). In about 70%, wheat allergy resolves by the age of six years. Sensitization to gliadin predicts persistent wheat allergy and a slower course of recovery (3).

The gluten-containing cereals wheat, rye, and barley are taxonomically closely related, and their storage proteins display extensive sequence homology and IgE cross-reactivity. Oats belong to the same grass family but are more distantly related to wheat. Oats do not contain allergens cross-reacting with wheat omega-5-gliadin, an allergen associated with severe wheat allergy (4). Oats are tolerated by most patients with celiac disease (1).

Oats have been reported to cause non-IgE-mediated reactions and are a well-known elicitor of FPIES (5). On the contrary, reports on severe IgE-mediated oats allergy are scarce with only a few published case reports (6, 7). The use of topical emollient creams containing oats seems to be a risk factor for percutaneous sensitization to oats in patients with atopic dermatitis and may cause even severe reactions to ingested oats. Oral food challenges to oats were, however, negative in 85% of oat-sensitized children with atopic dermatitis (8). Children with wheat allergy are frequently sensitized to oats, but they seem to tolerate ingested oats in their diet. Studies on clinical oats allergy in children with ehat allergy are lacking. Here, we demonstrate that children with challenge-proven wheat allergy and sensitization to oats tolerate ingested oats.

The Helsinki University Hospital of Children and Adolescents Ethics Committee approved the study and each participant as well as his/her guardian gave written informed consent. SPSS Statistics version 22.0 (IBM Corp, Armonk, New York, USA) was used in the analysis of the data.

The study included 15 wheat-allergic children, aged 9-16 years (median age 12.1 years), from the Department of Allergology, Helsinki University Central Hospital, Finland. The baseline characteristics of the study children are shown in Table 1. Of the 15 children, 10 (67%) were male, 11 (70%) had asthma, and 10 (67%) atopic eczema. Nine (60%) had another food allergy—typically hen's egg or nut allergy (Table 1).

All 15 children had persistent wheat allergy and were evaluated for forthcoming wheat oral immunotherapy. All were sensitized to wheat, gliadin, and oats (specific IgE ≥0.35 kU/l and/or skin prick test ≥3 mm) (Table 1). All had an adrenaline-autoinjector as an emergency rescue medication.

Serum IgE levels to oats, wheat, gliadin, and omega-5-gliadin were measured by ImmunoCAP (Thermo Fisher, Uppsala, Sweden). Specific IgE levels to oats were lower than the levels to wheat in all 15 children ($p<0.05$, T-test, of independent samples). The median IgE level to oats was 6.6kU/l, wheat 90.2kU/l, and gliadin 15.2kU/l. The median ratio of specific IgE to total IgE to oats was 0.015 (range 0.003-0.032), to wheat 0.201 (range 0.050-0.688) and to gliadin 0.028 (0.002-0.097). Ten children were sensitized to omega-5-gliadin with a median of 0.40kU/l. Skin prick tests (SPT) to wheat and oats (1:10 w/v 0.9% NaCl), and gliadin (1 mg/ ml, Sigma, St. Louis, MO, USA) were performed as previously described in 14/15 children (3). The median SPT reactions to oats, wheat, and gliadin and were 7mm, 10mm, and 6mm, respectively. One child had a negative oat SPT (Table 1).

The oral food challenges were performed according to the PRACTALL consensus criteria (9). Reaction severity was assessed using a dose-adjusted severity scoring of patients with a positive oral food challenge (10). Thirteen patients underwent an open oral wheat challenge.

Two patients were not challenged because of a recent severe reaction treated with adrenaline within the past 3 months. Wheat challenges were performed with wheat bread in increasing doses (10mg, 90mg, 500mg, and 1000mg) given at 30-60 minute intervals with a cumulative protein dose of 1600mg. All 13 wheat challenges were positive. The median cumulative dose that elicited symptoms was 370mg (range 10-1600mg). Four children (31%) needed intramuscular adrenaline. All were treated with antihistamines. Moderate or severe reactions occurred in 11 of 13 children (85%) (Table 2).

All 15 patients underwent an open oral oats challenge. The median time between the oats and wheat challenges was 15 days (range 1-42 days). The oats challenges were carried out with an oatmeal cookie following the same dosing protocol as for wheat. Fourteen of the 15 oats challenges were negative with a cumulative tolerated dose of 1600mg protein. Only one patient had a positive reaction with mild abdominal discomfort treated with antihistamine after a cumulative dose of 600mg. (Table 2). The specific IgE levels to oats, wheat and gliadin in this patient 8.65kU/l, 92.4 kU/l and 9.50kU/l respectively. In the wheat challenge, a cumulative dose of 600 mg of wheat protein provoked prolonged abdominal pain that was eventually treated with intramuscular adrenaline. No respiratory tract or skin symptoms were present.

Clinically irrelevant sensitization to oats is frequently observed in wheat-allergic children and is in all likelihood explained by cross-reacting IgE antibodies directed against similar epitopes in wheat and oats proteins. In this study, all but one of the oat-sensitized children with wheat-allergy were able to consume 1600mg of oats protein without symptoms. After the challenge, 13 of 14 children were able to consume oats freely at home. This is in

accordance with our long-time clinical experience with a large number of patients with severe wheat allergy. We have not seen a single case of oats anaphylaxis among these patients. The only observed reaction in the present study was mild abdominal discomfort that subsided after the administration of antihistamine.

We recommend that oats can be safely tested at home in wheat allergy if there is no previous history of an allergic reaction to oats. The routine measurement of oats-specific IgE in wheat-allergic patients with no history of an allergic reaction to oats seems not clinically useful and can increase unnecessary avoidance diets.

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Conflict of interest

The authors have no conflict of interest to declare.

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FIGURES AND TABLES.

Table 1 Characteristics and laboratory findings of the study children

Variable	Value	Laboratory Variable	Value
Age (years), SD	12.1 (2.6)	Eos (%), mean, SD	7.7 (3.6)
Sex, boys	10 (67%)	Total IgE (kU/l)	681 (128-2067)
Doctor diagnosed asthma	11 (73%)	Wheat-IgE (kU/l)	90.2 (12.8-671)
Doctor diagnosed atopic eczema	10 (67%)	Gliadin-IgE (kU/l)	15.2 (0.40-201)
Pollen allergy	12 (80%)	Omega-5-gliadin.IgE (kU/l)	0.40 (0-19.6)
Other food allergy	9 (60%)	Oats-IgE (kU/l)	6.6 (0.50-58.6)
		Wheat-SPT (mm)	10 (4-20)
		Gliadin-SPT (mm)	6 (3-10)
		Oats-SPT	7 (0-9)

Data are presented as mean and SD or median and the range or number of children and (%)

Table 2 Reactions in open oral food challenges

Variable	Wheat challenge (n=13)	Oats challenge (n=15)
Positive reactions	13 (100%)	1 (7%)
Mild reactions	2 (15%)	1 (7%)
Moderate/severe reactions	11 (85%)	0 (0%)
Use of adrenaline	4 (31%)	0 (0%)
Use of antihistamine	13 (100%)	1 (7%)
Cumulative protein dose in challenge ¤, mean mg, SD	370 (450)	1520 (280)

Data are presented as number of children and (%) or mean and SD